
A New Species of *Monardella* (Lamiaceae) from Baja California, Mexico, and Southern California, United States

Mark A. Elvin

UCI Arboretum, University of California, Irvine, California 92697-1450, U.S.A.
melvin@uci.edu

Andrew C. Sanders

Herbarium, Department of Botany and Plant Sciences, University of California, Riverside,
California 92521-0124, U.S.A. andrew.sanders@ucr.edu

ABSTRACT. *Monardella stoneana* (Lamiaceae), a narrow endemic from northern Baja California, Mexico, and southern San Diego County, California, is described and illustrated. Differences in leaf and bract morphology, pubescence, stem glands, and habitat separate it from *M. linoides* A. Gray and *M. odoratissima* Benth, apparently its closest relatives. The reinstatement of *M. viminea* Greene at the specific rank is supported on the basis of distinctive morphology and biological isolation. A key is included to separate *M. stoneana* from all of the perennial *Monardella* species known to occur in San Diego County, California.

Key words: Lamiaceae, *Monardella*, Peninsular Range, rare plants, taxonomy.

The genus *Monardella* Benth consists of approximately 30 species of annual and perennial herbs found in western North America with a center of distribution in California where almost all *Monardella* taxa are found. The flowers in this genus are remarkably similar, with many species having flowers that are virtually indistinguishable. The most notable exceptions are *M. macrantha* A. Gray and *M. nana* A. Gray, which are unique in that they have relatively longer flowers that appear to have evolved in response to long-tongued pollinators (Elvin & Sanders, pers. obs.).

Monardella species vary mostly in their vegetative characters, notably leaf size and shape, pubescence, and bract morphology. Therefore, adaptation to different pollinators does not appear to have been a major factor leading to speciation in this group. Instead, it appears to have been driven by a combination of isolation and vegetative and/or physiological adaptation to local conditions. This evolutionary pattern is not unique within the California Floristic Province. For example, *Ceanothus* L. (Rhamnaceae), *Arctostaphylos* Adanson (Ericaceae), and *Sibara* Greene (Brassicaceae) are all genera

where the taxa differ mostly in vegetative characters with little to no variation in floral morphology (see treatments in Hickman, 1993).

The perennial *Monardella* populations in southern California are confusingly similar but fall into natural groups based on a series of shared characters and generally non-overlapping ranges. The most difficult groups of species, and taxa that have regularly been confused in the field and herbaria, are in the subgenus *Monardella* sect. *Monardella* (*Pycnanthae* (Briquet, 1896) sect. *Odoratissimae* (Epling, 1925), but see Allen, 1994), which includes the *M. odoratissima* Benth and *M. linoides* A. Gray species groups. The taxa in these groups can be recognized by small but consistent differences between them (Abrams, 1912; Epling, 1925; Jepson, 1943) and have generally been recognized as distinct (Greene, 1902; Epling, 1925; Jokerst, 1993). With experience one can tell the general locale from which a particular plant came by the examination of a combination of pubescence, gland, leaf, and bract characters.

Plants in the *Monardella odoratissima* group have wide leaves (lance-ovate) and glabrous to sparsely pubescent herbage. Their leaves have a distinct petiole, an acute base, and a relatively broad blade that expands quickly to the widest point. The stems and leaves are generally either glabrous or sparsely pubescent to sparsely short villos. *Monardella odoratissima* is absent from southern California (Jepson, 1925; Munz, 1974; Beauchamp, 1986; Jokerst, 1993) except for the derivative taxon *M. australis* Abrams. We now add the San Ysidro Mountains species described below as a new member of the *M. odoratissima* group.

Plants in the *Monardella linoides* group are typically characterized by narrow leaves (broadly linear) and herbage covered with short, dense pubescence. Their leaves have a winged petiole, an

attenuate base, and a consistently relatively narrow blade that expands gradually to the widest point. The stems and leaves have short, dense pubescence in most cases, with mixed long and short, dense hairs in a few populations (e.g., *M. robisonii* Epling). *Monardella linoides*, which is nearly endemic to southern California, is represented by a series of allopatric populations that are separated by clusters of small but consistent characters (Gray, 1876; Greene, 1902; Abrams, 1912; Epling, 1925), which may prove to be distinct taxa. In our view, most of these populations can be readily separated without much ambiguity.

Many taxonomic problems exist in *Monardella*, but we are not commenting on the taxonomic status of all described entities at this time. Our intent in this paper is simply to better define the taxa in a discrete group of geographically and morphologically isolated plants in southern California. We do note that the Mojave Desert populations of *Monardella linoides* do not fit comfortably within *M. linoides* subsp. *linoides*, contrary to most recent floristic works (Munz, 1974; Jokerst, 1993). They have different morphologies, notably pubescence length and density, and are geographically isolated from *M. linoides* subsp. *linoides* of the Peninsular Range. The taxonomic status of these northern populations is a separate issue and will be the subject of future work. This paper describes one species that has been confused with another simply because they are parapatric and similar in appearance.

We have noticed that the perennial species of *Monardella* in southern California grow in sites that are relatively moist during the summer. They are commonly restricted to canyon bottoms, north-facing slopes, or other sites where water accumulates during the rainy season. However, they do not occur in permanently wet or saturated soils. This restriction to specialized and highly limited "micro-habitats" has resulted in patchy distributions and genetic isolation, providing opportunities for speciation. The product of one such apparent isolation event is described below.

Monardella stoneana Elvin & A. C. Sanders, sp. nov. TYPE: U.S.A. California: San Diego Co., "Monardella Gulch" on W side of Tecate Peak, E of Marron Valley, growing in cracks of bedrock and between large stones in the bottom of an intermittent stream, 22 July 2000, Mark A. Elvin & Cindy Burrascano 1460 (holotype, RSA; isotypes, NY, SD, UC, UCR). Figures 1–3.

Herba perennis, odoratissima; plantae subglabrae ad

puberulas pilis curtis et simplicibus et uni- aut bicellularibus; obscure et sparsim glandulosae; folia et caules virides sed saepe purpurascens prope apices; folia lance-ovata longitudine 15–30 mm et latitudine 4–10 mm; petioli distinguibiles; bracteae extimae plerumque bijugatae, mediae trijugatae et chartaceae, intimae aciculares; bractae longitudine 7–10 mm et latitudine 2.5–4 mm; semina brunnea ad nigra, ovata, longitudine 2.0–2.75 mm.

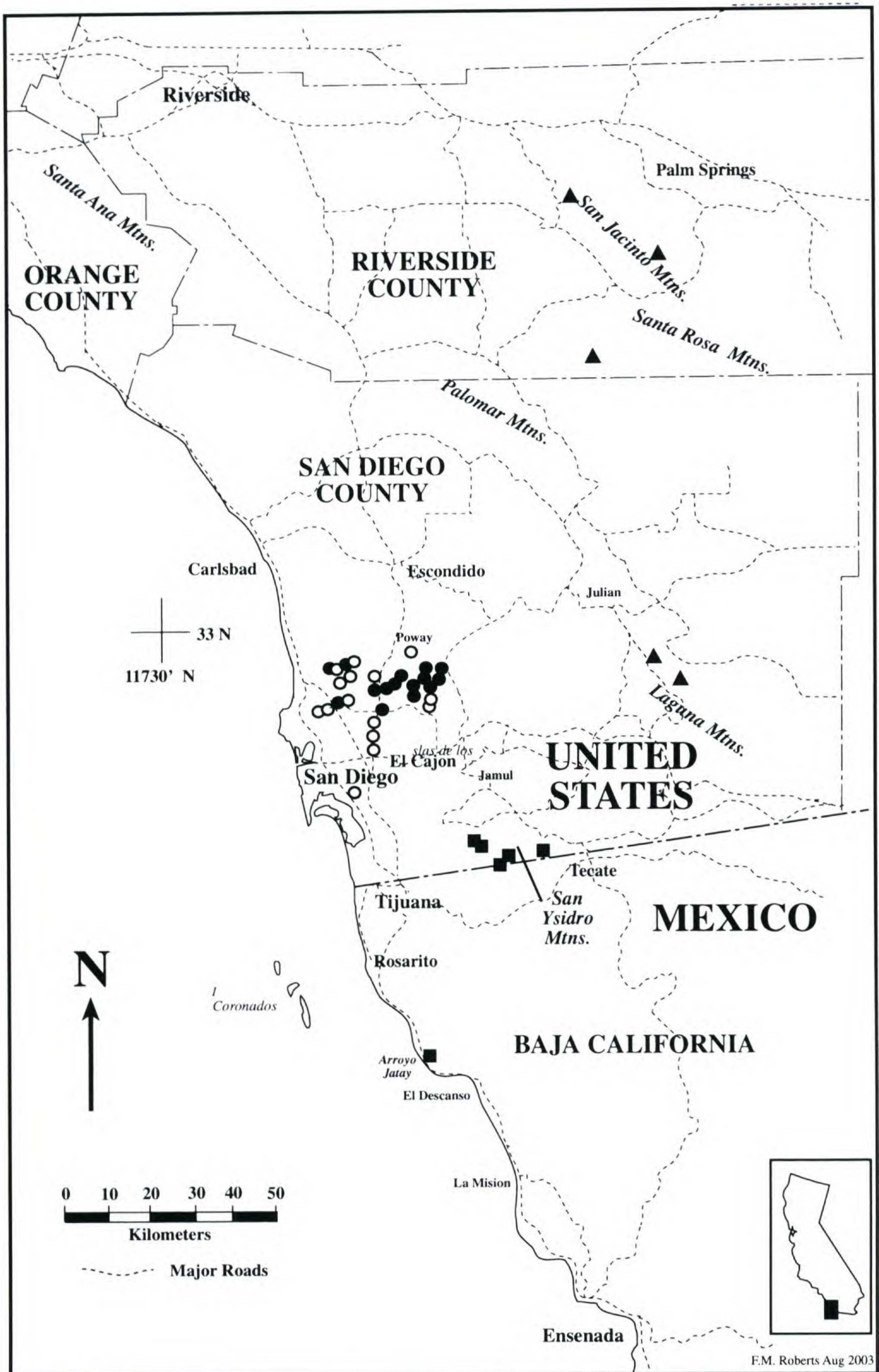
Suffruticose perennial, very odorous; low, compact, and non-rhizomatous; subglabrous to minutely pubescent with short, simple 1- or 2-celled hairs; obscurely and sparsely glandular (less than 50 glands/cm on one side of stem below the third leaf node from the apical glomerule); stems several to many, suffruticose, ascending to a height of 20–50 cm, rarely to 60 cm. Leaves lanceolate to lance-ovate, 15–30 × 4–10 mm (leaf length to width ratio 3–5:1), green but often purple-tinted near the stem apex, with distinct petioles 2–4 mm long, base acute, subglabrous to sparsely puberulent above and sparsely puberulent below (especially on the veins). Inflorescences glomerate; bracts: outermost ones generally in 2 pairs, middle ones papery and in 3 pairs (7–10 × 2.5–4 mm), lanceolate to narrowly lanceolate-ovate, innermost ones acicular; calyces of ± the same length as the middle bracts, generally with 13 veins. Flowers pale pink, sometimes tinged light blue, with corolla lobes 2.8–3.7 mm long. Seeds brown to black, ovate, 2.0–2.75 mm long.

Etymology. The specific epithet has a dual meaning. It honors our esteemed colleague, Jennifer Stone (1949–2000), who dedicated her life to the understanding and preservation of our special and diverse flora in southern California. It also refers to the species' frequent occurrence among the stones of intermittent streams. We propose "Jennifer's monardella" as the common name for this species.

Distribution and ecology. *Monardella stoneana* is a narrow endemic presently known from only six occurrences, five in the San Ysidro Mountains of San Diego County, California, U.S.A., and immediately adjacent Baja California, Mexico, and an outlying occurrence about 50 km to the south at Arroyo Jatay, about 75 km north of Ensenada. The California localities include the west side of Tecate Peak ("Monardella Gulch"), two unnamed canyons on the northwest side of Otay Mountain, and two canyons on the south side of Otay Mountain: "Copper Canyon" and "Wild Bill's Draw" (Fig. 2). This last canyon drains into Baja California and contains *Monardella* populations on both sides of the international boundary. It is possible that *M. stoneana* occurs in additional coastal arroyos and foothill



Figure 1. *Monardella stoneana* Elvin & A. C. Sanders. —A. Habit. —B. Inflorescence. —C. Flower. —D. Bracts. —E. Leaves and stem. Scale bars 1 cm, to the right of associated figures (B and D share a scale bar).



F.M. Roberts Aug 2003

Figure 2. Distributions of *Monardella stoneana*, *M. viminea*, and *M. linoides* subsp. *linoides*. (Note: This figure depicts a representation of the approximate distributions of these taxa and is not intended to represent precise location data from herbarium specimens.) Circles—*Monardella viminea*: open—extirpated occurrences, closed—extant occurrences (as of August 2003); squares—*Monardella stoneana*; triangles—representative *Monardella linoides* subsp. *linoides* locations.

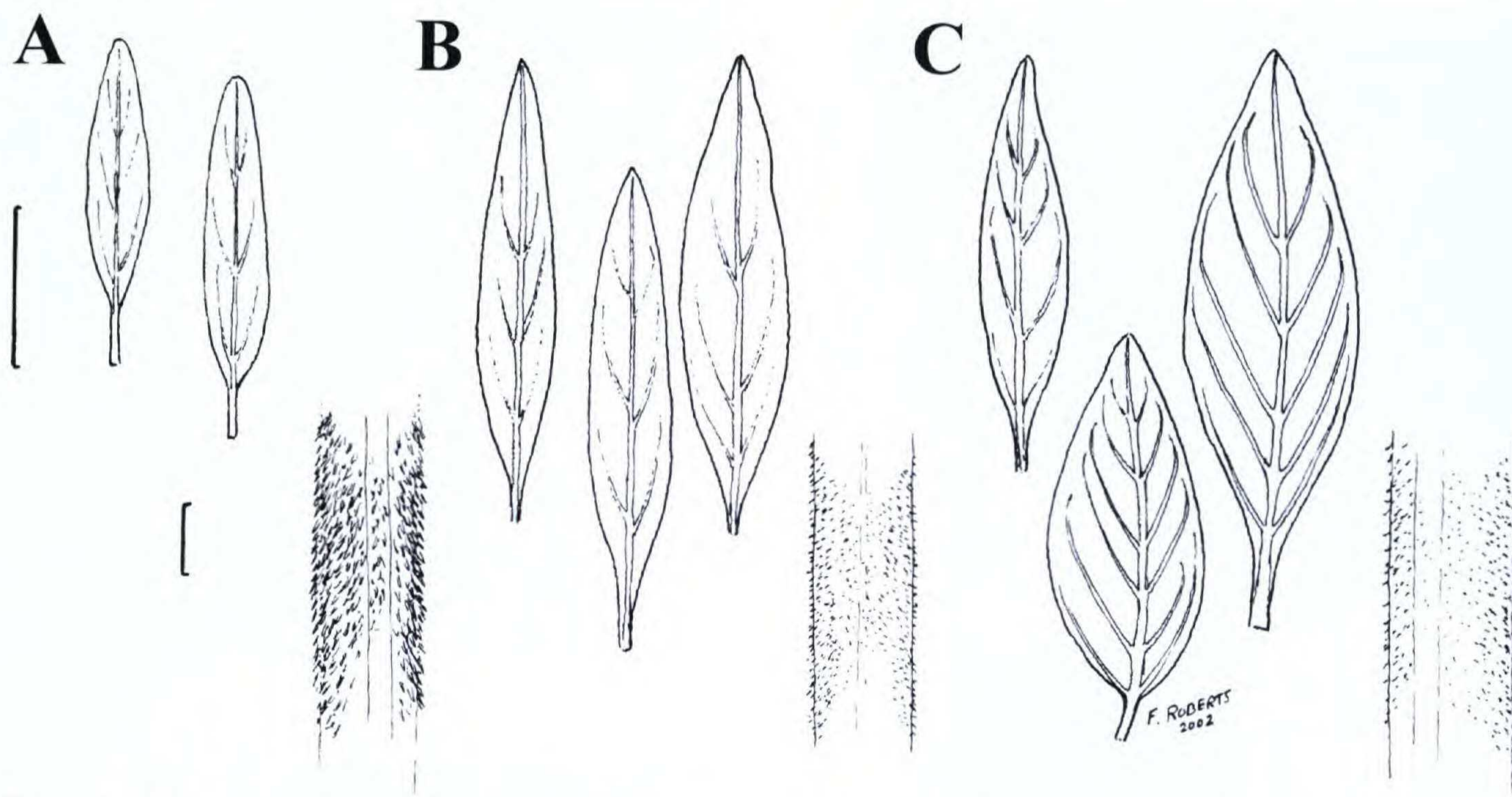


Figure 3. Pubescence details of the leaves (top) and stems (bottom) of *Monardella linoides* subsp. *linoides* (A), *M. viminea* (B), and *M. stoneana* (C). Leaf scale bar (top) = 1 cm, stem scale bar (bottom) = 1 mm.

canyons between the San Ysidro Mountains and Arroyo Jatay and possibly in similar habitats farther south. All known occupied sites are in intermittent streams that carry water for several weeks to months during and after the winter rainy season. The Arroyo Jatay site even supports fish and crayfish in permanent pools. *Monardella stoneana* most often grows among boulders, stones, and in cracks of the bedrock of intermittent streams in rocky gorges surrounded by coastal sage scrub and chaparral. It is found between 10 and 660 m elevation, with all known U.S. occurrences above 175 m.

Associated species in riparian habitat include *Baccharis salicifolia* (Ruiz & Pavón) Persoon, *Bothriochloa barbinodis* (Lagasca y Segura) Herter, *Brodiaea orcuttii* (Greene) Baker, *Cupressus forbesii* Jepson, *Iva hayesiana* A. Gray, *Juncus acutus* L. subsp. *leopoldii* (Parlatore) Snogerup, *Mimulus guttatus* DC., *Muhlenbergia rigens* (Benth) Hitchcock, and *Stemodia durantifolia* (L.) Swartz.

Monardella stoneana is similar to the *M. odoratissima* species group in leaf size, pubescence, and general appearance. Although it most closely resembles *M. glauca* and *M. odoratissima* subsp. *pallida* (A. A. Heller) Epling from northern California and Oregon, there are a number of differences between *M. stoneana* and taxa in the *M. odoratissima* group (e.g., herbage, bract size, leaf size, scent, habitat). *Monardella stoneana* is also similar to the *M. linoides* species group in leaf size, general appearance, and habit. Even though *M. stoneana* has been mistaken for a species in the *M. linoides* group

in the past, there are several differences that separate it from that group.

Paratypes. MEXICO. **Baja California:** in drainage ("Wild Bill's Draw"), S side of Otay Mtn., 12 Aug. 2000, C. Burrascano, M. Kelly, L. Braund & R. Hutsel s.n. (SD); Arroyo Jatay, 11 June 1980, R. Moran 28774 (SD), 27 July 2001, A. C. Sanders & M. A. Elvin 24488, 24514, 24517 (UCR). U.S.A. **California:** in dry streambed & mixed chaparral on Tecate Peak, 20 June 1979, F. Sproul s.n. (SD); Otay Mtn., mesic canyon S of Otay Lake, 19 June 1987, C. Reiser s.n. (SD); San Ysidro Mtns., NW foothills just SE of Otay Lake, 2.0 km ENE of Savage Dam along unnamed canyon above Buschalaugh Cove, 20 June 2001, F. Roberts 5500 (UCR); Marron Valley, tributary to Cottonwood Creek, "Monardella Gulch," W slope of Tecate Peak, 4 Aug. 2000, A. C. Sanders & M. A. Elvin 23593 (UCR).

RELATIONSHIPS OF *MONARDELLA STONEANA*

Monardella stoneana belongs in subgenus *Monardella* sect. *Monardella* and within that is most closely related to the *M. odoratissima* group (including *M. glauca* Greene) and less closely to the *M. linoides* group, specifically *M. linoides* subsp. *viminea* (Greene) Abrams. *Monardella stoneana* differs from the species in each of these groups in a number of characters (e.g., leaf and bract morphology, pubescence, stem glands, habitat). It has commonly been confused with *M. linoides* subsp. *viminea*, apparently simply because that is the only similar *Monardella* that has been recognized as present at low elevations in San Diego County, California, until now.

THE *MONARDELLA ODORATISSIMA* GROUP

The herbage of *Monardella stoneana* is less puberulent and less glandular than *M. odoratissima*, which is minutely but conspicuously puberulent, and sparsely to moderately glandular. *Monardella stoneana* inflorescence bracts, those subtending the head, are smaller and greener than those of *M. odoratissima*, which are relatively large (8–17 × 4–10 mm), longer than the subtended calyces, and white or purple-tinged. The leaves of *M. stoneana* are shorter and narrower (length to width ratio of 3–5:1) than those of *M. odoratissima* (length to width ratio of 2–3:1). *Monardella stoneana* leaves are lanceolate to lance-ovate, while *M. odoratissima* has lance-ovate to ovate leaves (5–16 mm wide). *Monardella stoneana* has a pungently minty scent, while *M. odoratissima* has a sweeter scent more typical of *Monardella*.

Monardella stoneana grows in more perennially mesic environments than those of *M. odoratissima* (including *M. glauca* and *M. odoratissima* subsp. *pallida*), which grows on dry slopes and flats, which are often open and sandy or gravelly. *Monardella odoratissima* occurs at higher elevations in montane forests of the Sierra Nevada Mountains (Jepson, 1943; Munz, 1959; Botti, 2001) that are at least 300 km to the north beyond the Transverse Range and Mojave Desert. This separation by a mountain range and a desert acts as a strong geographic isolating mechanism. Habitats in the San Bernardino and San Jacinto Mountains of southern California that are similar to those occupied by *M. odoratissima* in the Sierra Nevada Mountains contain the *M. odoratissima* segregate species *M. australis* (Jokerst, 1993).

THE *MONARDELLA LINOIDES* GROUP

Monardella stoneana is distinct from the *M. linoides* group, specifically *M. linoides* subsp. *viminea*. *Monardella stoneana* grows in an environment that is wet for a much longer period of time than *M. linoides* subsp. *viminea*. The herbage of *M. stoneana* is less hairy than that of *M. linoides* (including that of *M. linoides* subsp. *viminea*). The stems and leaves of *M. stoneana* are sparsely glandular, while those of *M. linoides* subsp. *viminea* are conspicuously and rather densely glandular with greater than 100 glands/cm on one side of stem below the third leaf node from the apical glomerule. *Monardella stoneana* leaves are broader and have a more distinct base and petiole than *M. linoides* subsp. *viminea*, which has broadly linear to narrowly lanceolate leaves (2–4 mm wide) with attenuate bases (Fig. 3). The bracts of *M. stoneana* are rough-

ly equal to the calyces (middle bracts 7–10 mm long), while the bracts of *M. linoides* subsp. *viminea* are longer than the calyces (middle bracts 10–15 mm long). The relatively large leaves and small bracts of *M. stoneana* readily distinguish it from *M. linoides*, which has relatively small leaves and large bracts.

SPECIES RECOGNITION FOR *MONARDELLA VIMINEA*

Monardella viminea Greene, Pittonia 5: 85. 1902. *Madronella viminea* (Greene) Greene, Leaflet Bot. Observ. Crit. 1: 169. 1906. *Monardella linoides* A. Gray var. *viminea* (Greene) Munz, Manual Southern California Botany, 450. 1935. *Monardella linoides* A. Gray subsp. *viminea* (Greene) Abrams, Ill. Fl. Pacific States 3: 655. 1951. TYPE: U.S.A. California: San Diego Co., locality not given, 1880, Vasey 491 (holotype, US).

Monardella viminea was originally described by Edward Greene (1902). It was subsequently reduced to varietal rank by P. A. Munz (1935), then shifted to subspecies rank by Leroy Abrams (1951), who has been followed by subsequent authors (e.g., Munz, 1974; Jokerst, 1993). While *M. viminea* and *M. linoides* subsp. *linoides* are undoubtedly closely related, these two taxa are reproductively isolated from each other based on specimen collections between 1862 and 2003 (see selected specimens). *Monardella viminea* flowers from June until August; while *M. linoides* subsp. *linoides* does not flower until September, though some plants occasionally begin flowering in July on the lower desert slopes. The two species occur in radically different environments. *Monardella viminea* is endemic to coastal sage scrub and grows on secondary alluvial benches in ephemeral washes (drainages with running surface water for 24–48 hours after a rain) that cut through cismontane marine and alluvial terraces of the Miramar area within 20 km of the Pacific Ocean. *Monardella linoides* subsp. *linoides* predominantly occurs in transmontane, semi-desert woodlands dominated by pinyons (*Pinus*) and junipers (*Juniperus*). These two *Monardella* taxa are geographically well separated by the Peninsular Range in southern California and adjacent northern Baja California, Mexico. The closest populations are separated by about 50 km in distance and at least 900 m in elevation (Fig. 2). Because of the ecological, seasonal (flowering time), and geographical isolating mechanisms in the wild, there appears to be no opportunity for them to interbreed. No putative hybrids are known to have been collected. We have had both taxa in cultivation under identical con-

ditions at the University of California, Irvine Arboretum, for about two years and noted that they behave differently with respect to flowering. *Monardella viminea* flowers readily, and the flowering period for an individual may last up to 10 to 12 weeks. *Monardella linoides* subsp. *linoides* flowers hesitantly, and the flowering period for an individual lasts only three to four weeks at best. In cultivation the blooming period of *M. viminea* completely overlaps that of *M. linoides* subsp. *linoides*.

These two taxa are also separable on foliage scent, pubescence type, stem glands, and leaf size. *Monardella viminea* has a strong sweet scent, while *M. linoides* subsp. *linoides* has only a very faint scent, often virtually absent. The pubescence of *M. viminea* is relatively sparse, while that of *M. linoides* subsp. *linoides* is short and very dense and obscures the epidermis. Possibly due to this pubescence difference, the glands on the stem of *M. viminea* are conspicuous, but those of *M. linoides* subsp. *linoides* are difficult to detect. The leaves of *M. viminea* are about 15–40 mm long while those of *M. linoides* subsp. *linoides* are about 10–20 mm long (Fig. 3).

Selected specimens. Monardella australis. U.S.A. **California:** 10 July 1994, Sanders & MacKay 14992 (UCR), 26 Sep. 1992, Dick Swinney 1932 (UCR), 7 Aug. 1968, Louis C. Wheeler s.n. (UCR).

Monardella glauca. U.S.A. **California:** 28 Aug. 1935, B. Bolt 422 (RSA), 10 July 1975, F. C. Vasek 750710-29 (UCR), 20 Aug. 1965, C. B. Hardham 13009 (RSA), 13 June 1940, A. Eastwood & J. T. Howell 8175 (POM), 12 Aug. 1965, G. Muth 209 (RSA).

Monardella linoides subsp. *linoides.* U.S.A. **California:** 7 June 1963, R. H. Whittaker & W. Niering 280 (IRVC), Oct. 1875, Cleveland 6861 (SD), 14 June 1997, R. E. Riefner 97-188 (RSA), 5 Sep. 1927, I. L. Wiggins 2860 (RSA), 3 Aug. 1935, G. F. Harbison 12106 (SD).

Monardella odoratissima subsp. *pallida.* U.S.A. **California:** 6 Aug. 1927, F. W. Peirson 7659 (RSA), 1 Sep. 1929, C. B. Wolf 3782 (RSA), 6 Aug. 1967, J. Hendrickson 2516 (RSA), 20 July 1917, A. L. Grant 1125 (POM).

Monardella viminea. U.S.A. **California:** 1 Aug. 1982, J. Dice & L. Allen s.n. (SD), 3 Aug. 1982, C. Patterson 1154 (SD); 12 May 1894, T. S. Brandegees s.n. (POM), 8 July 1934, Carl Epling 6253 (RSA).

CONSERVATION NOTES

Recognition of *Monardella viminea* at the species rank is significant because the known range of this rare taxon is now restricted to the Miramar Mesa region of San Diego County, California. It is a narrow endemic that remains in only three major watersheds in the Miramar area: (1) Sycamore and West Sycamore Canyons, Murphy and Elanus Canyons, and Spring Canyon; (2) San Clemente Canyon; and (3) Lopez Canyon (see Fig. 2). *Monardella viminea* historically occurred in Beeler, Carroll,

and Switzer Canyons (near Poway, Miramar, and San Diego, respectively). *Monardella stoneana* is also a narrow endemic that is only known in the United States from five canyons in two watersheds and Mexico in one canyon (Fig. 2).

KEY TO THE PERENNIAL *MONARDELLA* SPECIES IN SUBGENERA *MONARDELLA* AND *MACRANTHAE* KNOWN TO OCCUR IN SAN DIEGO COUNTY, CALIFORNIA

- 1a. Calyces greater than 12 mm, lobes $\frac{1}{5}$ – $\frac{1}{2}$ length of tube; plants generally low and spreading; stems decumbent; plants rhizomatous; leaves usually \pm ovate, often strongly so (*Monardella* subg. *Macranthae*).
 - 2a. Corollas scarlet to red-orange, corolla tube width at opening $>$ 3.1 mm; corolla tube funnellform; pollen white; tube 35–45 mm long; calyx greater than 15 mm long *M. macrantha* A. Gray
 - 2b. Corollas pale white or pastel yellow or pastel pink; corolla tube width at opening $<$ 3.1 mm; corolla tube cylindrical; pollen pink to lavender; tube 20–30 mm long; calyx less than 15 mm long *M. nana* A. Gray
- 1b. Calyces less than 12 mm, lobes \pm equal length of tube; plants generally subshrubs; stems generally ascending to erect; plants not or only weakly rhizomatous; leaves narrowly lanceolate to ovate (*Monardella* subg. *Monardella*).
 - 3a. Leaves distinctly bicolored, green above and paler beneath *M. hypoleuca* A. Gray
 - 3b. Leaves concolorous, similar on both surfaces.
 - 4a. Pubescence very dense, stems and leaves whitish with epidermis obscured; foliage very faintly scented; glands inconspicuous; dry interior, montane slopes *M. linoides* A. Gray subsp. *linoides*
 - 4b. Pubescence sparse, stems and leaves green with epidermis visible; foliage strongly scented; glands conspicuous; ephemeral drainages (moist or seasonally wet environments) in coastal foothills and mesas.
 - 5a. Leaves broadly linear to narrowly lanceolate with attenuate bases, 2–4 mm wide, length to width ratio 7–10:1; leaf glands dense below; stem glands greater than 100/cm on one side below the third leaf node from the apical glomerule; middle bracts 10–15 mm long (longer than calyces); seeds less than 1.9 mm long; plants in ephemeral washes (water only running directly after rain) on secondary alluvial benches *M. viminea* Greene
 - 5b. Leaves lanceolate to lance-ovate with acute bases, 4–10 mm wide, length to width ratio about 3–5:1; leaf glands sparse below; stem glands less than 50/cm on one side below the third leaf node from the apical glomerule; middle bracts 7–

10 mm long (roughly equal to calyces); seeds greater than 1.9 mm long; plants in streambeds and banks of intermittent streams (water running longer than directly after rain)

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